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The effects of fiscal decentralization on working hours: Does it matter which government level taxes and spends?*

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Abstract

Does the degree of fiscal decentralization have an effect on the observed work effort? Fiscal decentralization and the resulting competition among governmental units may have a positive effect on hours worked, first, by reducing the overall tax burden, and, second, by increasing the effectiveness of governmental services and reducing the regulatory burden. I account for the effect of the overall tax burden and use various measures of fiscal decentralization, to analyze the relationship between fiscal decentralization and the amount of annual hours worked for a group of OECD countries. I find evidence in support of a positive association between an increase in fiscal decentralization and a rise in hours worked primarily in countries with an otherwise predominantly federal political structure.

Keywords: fiscal decentralization, hours worked, federal, autonomy, revenue decentralization, tax decentralization, expenditure decentralization

JEL codes: H1, H7

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1 Introduction

Does it matter for the exerted work effort how decentralized a state's taxing and spending activities are? To provide an empirical answer to this question, I analyze the effects of fiscal decentralization on annual hours worked per capita in the 'official' economy for a set of OECD countries, including, among others, Germany, France, Italy, and the U.S. The results point to a positive effect of an increase in fiscal decentralization on hours worked primarily in countries that feature an otherwise predominantly federal political structure.

The degree of fiscal decentralization may affect economic performance through two channels. First, the degree of fiscal decentralization may influence the tax collection efforts of governmental units. Second, the extent of fiscal decentralization may have an impact on the use of the collected tax revenues. My goal here is to investigate the effect of fiscal decentralization through this potential second channel. If the degree of fiscal decentralization affects the effectiveness of government services and regulation, the relative attractiveness of work in the 'official' economy depends in part on the degree of fiscal decentralization. I aim at providing an empirical investigation of the effect of decentralization through the effectiveness-of-public-goods-and-regulations channel by analyzing whether fiscal decentralization has an effect on hours worked after the potential indirect effect of decentralization on hours worked via the magnitude of the tax burden has been accounted for.

In addition, I further investigate if the effect of fiscal decentralization on hours worked depends on whether a country has a federal political structure or a political structure that is better characterized as unitary. Fiscal decentralization may be used as one measure of the degree to which a country is organized as a federation. But it is not the only possible measure. For instance, in a federal system sub-central governmental units are in a better position to influence decision making processes on the national level than in unitary countries. The effect of fiscal decentralization on the amount of average hours worked per person per year may therefore

depend on whether the sub-central governmental units are embedded in an otherwise predominantly federal or unitary political structure.

My investigation is related to two empirical research streams in economics; a literature on the effects of taxes on hours worked per capita in the 'official' economy and a literature on the effects of fiscal decentralization on economic performance. Cross-country empirical evidence documents a negative correlation between annual hours worked per person in the 'official' economy and the tax burden faced by the population (see, for instance, Olovsson 2009; Davis and Henrekson 2004; Nickell 2004; Schettkat 2003). But in contrast to my analysis, the contributions to the literature on the nexus of taxes and hours worked do not analyze the effect of differences in the degree of fiscal decentralization.

There is a rich empirical literature on the effects of fiscal decentralization on measures of economic performance. For instance, the relation of fiscal decentralization and economic growth (Baskaran and Feld 2009; Thornton 2007a; Iimi 2005; Stansel 2005; Akai and Sakata 2002; Xie et al. 1999; Davoodi and Zou 1998), the size of government (Jin and Zou 2002; Marlow 1988), inflation (Baskaran 2011; Thornton 2007b), corruption (Arikan 2004), and social capital (De Mello 2004) are investigated. However, to my knowledge, an investigation of the effects of fiscal decentralization on hours worked is lacking from this literature. My goal is to provide a contribution that fills the gap.

My analysis is based on a panel data set of OECD countries. One set of measures of fiscal decentralization covering the years 1990 to 2011 is retrieved from OECD sources. They measure the fraction of overall government expenditure and government revenue that can be assigned to sub-central governmental units. Another set of fiscal decentralization measures covering the years 1980 to 2000 is adopted from Stegarescu (2005, 2004), who applies the OECD (1999) taxonomy of fiscal authority of sub-central governmental units, which was developed to measure *de facto* fiscal decentralization instead of *de jure* fiscal decentralization. The OECD

(1999) categorization therefore allows minimizing the risk that sub-central governmental fiscal activity is identified as being autonomous from the central government, when in fact the central government controls the fiscal activity of the sub-central governmental units.

I find evidence in support of a positive relationship between fiscal decentralization and hours worked, while accounting for the effect of the overall tax burden on hours worked. Cross-section as well as panel evidence suggests that larger degrees of fiscal decentralization are associated with more annual hours worked per person. However, the results of the panel analysis indicate that the found positive relationship is driven by federal countries. Whereas the findings for federal countries suggest that increases in fiscal decentralization are related to higher work efforts, the panel analysis results for unitary countries are ambiguous, as they do not consistently point to a positive effect of fiscal decentralization on the amount of hours worked per person.

The paper proceeds as follows. The next section provides a discussion of possible causal connections between fiscal decentralization and the work effort exerted in the 'official' economy. Section 3 gives an overview of the data. Section 4 features the empirical analysis and presents the results. Section 5 concludes.

2 Decentralization and productive activities

In the absence of interjurisdictional externalities and economies of scale in the provision of local public goods by the central government, according to the "Decentralization Theorem" a distribution of public goods that considers local tastes is always a Pareto-improvement over a uniform distribution (Oates 1999, 1122). If the central government was omniscient and benevolent, it could implement an optimal distribution of public goods that accounts for regional differences. When the omniscience assumption is dropped and information asymmetries between the central and local government are taken into account, the decentralized provision of local public goods is Pareto-optimal. The optimality stems from the local government's superior knowledge of the local conditions, such as the preferences of the citizens in a certain region and regional relative prices.

Matters get more complicated when the benevolence assumption is also dropped. As soon as representatives of local and central governments alike are assumed to primarily pursue their private objectives – constrained by the set of institutions that prevail in the public domain – instead of some public interest, the interests of the population and the governments as well as the interests of representatives of various governmental units can no longer be assumed to be perfectly aligned. Thus, in the absence of benevolent and omniscient governments conflict may arise, first, between citizens and governmental units and, second, between various governmental units. Both potential sources of conflict have attracted attention in the literature on fiscal federalism – especially in the more recent literature that Oates (2005) identifies as "second generation fiscal federalism" as it focuses on the incentives that various players face in federal systems.

Brennan and Buchanan (1980) neither assume omniscience nor benevolence and argue that decentralization of government works as constraint on the expansionary tendencies of government. The citizens are in a better position to hold a local governmental unit accountable

for its actions than a central governmental unit. The argument for decentralization is no longer that local governmental units have better knowledge of local circumstances, but that it is more difficult for local governments to exploit the citizens than it is for central governments. However, one could also argue that local governmental units are in a better position than the central government to predate on the local population. Given more independence under decentralization, local governmental units can make use of their detailed knowledge of local circumstances to exploit their citizens. Thus, an increase in decentralization may theoretically lead to an improvement or a worsening of the citizens' position vis-a-vis the structure of government they face.

Further, a more decentralized structure of government may imply more effective constraints on the behavior of government as various governmental units compete with one another. The more decentralized the governmental structure the less the central government has a monopoly on the exertion of governmental force and has to share the market for governmental services with local governmental units. Citizens may then be better protected from government opportunism as various governmental units compete for the citizen's approval who can more credibly threaten to exit from a jurisdiction. However, a larger degree of fiscal decentralization may also lead local governmental units to use the central government as a vehicle to exploit the budgetary commons. The citizens may then suffer from additional opportunistic behavior of the central government that is driven by more independent local governmental units that individually, for instance, lobby the central government to be spared from stocking the budgetary commons, be favored when it comes to harvesting the budgetary commons, or engage in unsound fiscal policy as they expect to be bailed out by the central government in times of financial distress (see, for instance, Kornai et al.(2003) and Fink and Stratmann (2011)).[1]

[1] See Wagner (1992) for an interpretation of government revenue as budgetary commons.

To summarize, in theory there are positive and negative effects of an increase in decentralization on the quality of government when the assumptions of omniscience and benevolence of government representatives are no longer maintained. Positive effects may stem from an increase in competition between governmental units and from a betterment of the citizens' position to hold governmental units accountable. Negative effects may result from an increase in the local governmental units' abuse of their knowledge of local conditions and more extensive exploitation of the budgetary commons.

Thereby, decentralization may work through two channels. First, decentralization may affect the overall tax burden faced by the citizens. Second, decentralization may affect the quality of the government's services – its provision of goods and regulatory measures. The question whether the positive effects of decentralization through these two channels outweigh the negative effects is an empirical one. One dimension along which the effects of decentralization through the two channels can be assessed is their impact on hours worked in the 'official' economy.

If decentralization affects the overall tax burden, the degree of fiscal decentralization may indirectly affect the number of hours worked per member of the working age population of a country. Prescott (2004) famously argues that the differences in working hours between the U.S. and European countries, which can be observed today, can to a large degree be explained by differences in the marginal tax rates of the two groups of countries. Other empirical studies also find that higher tax burdens are associated with a smaller annual work load (see, for instance, Olovsson 2009; Davis and Henrekson 2004; Nickell 2004; Schettkat 2003).

Besides affecting hours worked via the tax burden, decentralization may have an indirect impact on hours worked via its effect on the quality of government services. Governmental units not only decide on the level of revenues and expenditures, they also decide how to raise funds, how to spend the funds on which government services, and what rules and regulations to set for

the market sphere. By so doing they have an influence on the incentives faced by participants in the market sphere to engage in productive activities in the 'official' economy. If an increase in fiscal decentralization leads to an improvement in the quality of government, which increases the individuals' productivity in the 'official' economy, people can be expected to work longer hours as long as the substitution effect of higher wages outweighs the income effect.

In light of the foregoing discussion I posit hypothesis 1: While controlling for the tax burden, an increase in fiscal decentralization leads to an increase in hours worked in the 'official' economy per member of the working age population.

The effects of fiscal decentralization may differ depending on whether a country's general political structure is of a unitary or federal nature. Fiscal decentralization is one measure for the authority of sub-central governmental units in a political system. Other possible factors that indicate the autonomy of sub-central governmental units are the extent to which they constitute the relevant authorities for the people who live in the respective regions and the degree to which the representatives of sub-central governmental units are able to exert influence on national affairs (Hooghe et al. 2009). An increase in fiscal decentralization may have a stronger positive effect on the incentive to work in an otherwise predominantly federal country than in an otherwise predominantly unitary country, if fiscal decentralization leads to a more pronounced increase in governmental competition and the citizens' ability to hold governmental units accountable in primarily federal countries than in primarily unitary countries.

Concerning the differences between unitary and federal countries, I therefore posit hypothesis 2: While controlling for the tax burden, an increase in fiscal decentralization leads to a stronger increase in hours worked per member of the working age population in the 'official' economy in federal countries than in unitary countries.

3 Data

For measures of fiscal decentralization I use two sets of data. One set consists of *classic* measures. They indicate the local and regional governments' expenditure and revenue shares of the overall government expenditure and revenue as recorded in official documents. The alternative set consists of measures, which take into account that non-central governmental units may not have full control over the revenues and expenditures ascribed to them as, for instance, the central government may decide which services have to be provided to the public via the expenditure of a sub-national governmental unit or tax revenues of sub-national governmental units may be from taxes for which sub-national units can neither set the tax base nor the tax rate.

Data used as a *classic* measure of fiscal decentralization are provided by the OECD's *Fiscal Decentralization Database*. The use of these *classic* measures is still common in the recent literature on fiscal decentralization (see, for instance, Neypati (2010) and Lessmann and Markwardt (2010)). The OECD provides data on consolidated government revenue and government expenditure. The consolidated measures take intergovernmental transfers into account and deduct intergovernmental transfer revenues and expenditures of the various governmental levels from their revenues and expenditures. I use two *classic* measures of fiscal decentralization. First, *revdec* is the fraction of a country's overall government revenue that is not raised by the central government and constitutes a measure of fiscal decentralization on the revenue side. Second, *expdec* is the fraction of a country's overall government expenditure that is not spent by the central government and constitutes a measure of fiscal decentralization on the expenditure side. Local and regional governmental units alike are treated as non-central governmental units since the systems of government vary across the considered countries. Data on *revdec* and *expdec* are available for the years 1990 to 2011 for 27 countries.[2]

[2] See Table 2 for an overview of the countries for which the measures *revdec* and *expdec* are available.

Stegarescu (2005) provides measures of fiscal decentralization that take into account that control over some of the revenues and expenditures of sub-national governments by the governmental units at these levels may be incomplete. Stegarescu (2005) follows and expands the classification proposed in OECD (1999) to build adjusted measures for fiscal decentralization that take into account to which extent sub-central governmental units can *de facto* exert autonomous control over expenditures and revenues ascribed to them. Since their publication, the data by Stegarescu (2004) have been used repeatedly in the literature on fiscal decentralization (see, for instance, Baskaran and Feld (2009); Baskaran (2011, 2012)). The measure RD adopted from Stegarescu (2004) indicates the autonomous own revenue of sub-central governmental units as share of the total consolidated revenue of the overall government in a country. Also adopted from Stegarescu (2004), the measure TD indicates the autonomous own tax revenue of sub-central governmental units as share of the total consolidated tax revenue of the overall government.[3] Data on the measures RD and TD are available only for a subset of the years under investigation. In Stegarescu (2004), the year 1979 is the first to contain RD entries for Canada and 1980 is the first year to contain RD data for Norway and the U.S. The data on RD and TD provided by Stegarescu (2004) end with the year 2001.[4] For the TD and the RD measure many observations are missing for the year 2001. Therefore, I consider the data on TD and RD for the years 1980 to 2000.[5]

Following Baskaran and Feld (2009, 8), data provided by the OECD on the total tax revenue of the overall government as percentage of GDP are used as a measure of a country's tax burden, and thus the overall size of government, in a certain year.

[3] I am grateful to Dan Stegarescu for granting me access to his data sets.
[4] Extending the Stegarescu (2004, 2005) data sets beyond the year 2001 goes beyond this paper. To provide a consistent extension of Stegarescu's data would require the application of the same rules for the categorization of certain revenues and expenditures depending on the degree to which local governmental units control them. How certain revenues and expenditures in certain countries in certain years were categorized is not revealed by Stegarescu (2004, 2005). I therefore leave it to future work to collect a consistent data set following the approach by Stegarescu (2004, 2005) that extends beyond the year 2001.
[5] See Table 2 for an overview of the countries for which the measures *TD* and *RD* are available.

Data on total hours worked were retrieved from the *The Conference Board Total Economy Database*™. *The Conference Board* provides data on total hours worked in a country within a year by all those productively employed – including employees, self-employed workers, unpaid family members, apprentices, and military personnel. Data on the working age population was retrieved from the OECD. The OECD provides data on the size of a country's population between 15 and 64 years of age. Dividing the total hours worked by the working age population of a country gives the measure *hours* that is used as the measure for hours worked per person per year in this paper. Alternative measures for the working age population are the *Total Labor Force* that does not include currently "inactive" members of society who attend educational institutions, perform household duties, are retired on pension and capital income, or are impaired and the *Civilian Labor Force* that corresponds to the *Total Labor Force* but excludes the armed forces. Since I am interested in the effects of taxation and fiscal decentralization on the decision of how many hours to work in the 'official' economy, I use the measure based on the population aged 15 to 64, which includes those who are old enough to work and could potentially take up work in the 'official' economy. The incentives to work guide the decisions not only of those currently on the labor market but also of those who currently neither work nor look for jobs.

The variable *federal* indicates whether a country in a certain year is considered as federal or unitary. *federal* was constructed based on the *Regional Authority Index* by Hooghe et al. (2009). Hooghe et al. (2009) built the index by measuring, first, to what extent the regional governments of a country exercise authority over those who live in the respective regions ("self rule") and, second, to what extent regional governments exercise authority in the country as a whole ("shared rule").[6] The *Regional Authority Index* for a country is derived by first calculating

[6] "Self rule" is measured by taking into account the autonomy of regional governments ("institutional depth"), the range of responsibilities of regional governments ("policy scope"), the extent to which a regional government can impose taxes ("fiscal autonomy"), and to what degree regions have independent legislatures and executives ("representation"). "Shared rule" is measured by accounting for the degree to which regional governments have regional and national legislative authority ("law making"), the extent to which regional governments determine

a score for each tier of regional government and then aggregating the scores. Each regional government tier can score between 0 and 24, whereby 24 indicates the largest possible degree of regional authority (Hooghe et al. 2009, 48). I consider countries to feature predominantly federal characteristics, and code them as federal, if their *Regional Authority Index* score takes on a value of 17 or higher in a certain year.[7] For instance, in 2006 Germany had a score of 29.3, France of 16.0, and the United Kingdom of 9.5.[8] Table 2 provides an overview of the classification of the included countries as either unitary or federal.

Further data on inflation measured as consumer price index growth and GDP growth are included as control variables. Descriptive statistics of the data and further information concerning the sources are provided in Table 1.

4 Empirical analysis

Cross-section evidence

Figures 1 to 3 allow a first glance at the correlation between hours worked per person per year and various measures of fiscal decentralization. Figure 1 presents average data for the years 1980 to 1989, Figure 2 for the years 1990 to 1999, and Figure 3 for the years 2000 to 2011. In all figures the scatter plots on the left include all the countries for which averages could be built for the respective time periods.[9] Except for the fitted line on the left hand side plot of Figure 2d, the fitted lines in all scatter plots on the left hand side of Figures 1 to 3 have a positive slope. Thus,

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national policies ("executive control"), the impact of regional governments on the distribution of national taxes ("fiscal control") , and the extent to which regional governments affect constitutional change ("constitutional reform").

[7] Hooghe et al. (2009) provide data for the *Regional Authority Index* for the years 1980 to 2006. For the years 2007 to 2011 I assumed the *Regional Authority Index* score for the countries to be the same as in the year 2006 to code the indicator variable $federal$.

[8] Choosing a score of 17 or higher on the *Regional Authority Index* is to some degree arbitrary. But for the EU countries considered the chosen cut off point leads to a classification similar to the one made by Foremny (2011, 27), who categorizes 15 EU countries into unitary states and federal states based on their institutional structure.

[9] In some cases a time period that is shorter than the mentioned time period was used to build a country's average fiscal decentralization measure and/or average amount of hours worked per person per year.

there is a positive correlation between the measures of fiscal decentralization and the average hours worked per person per year. These results do neither allow drawing conclusions regarding the causal relationship between fiscal decentralization and hours worked nor do they allow accounting for different channels through which fiscal decentralization may affect the amount of hours worked, but the presented graphs suggest that a positive relationship between fiscal decentralization and hours worked does exist.

The scatter plots on the right hand side of Figures 1 to 3 allow differentiating the correlation of measures of fiscal decentralization and hours worked in federal countries from those in unitary countries included in the data set. For the three time periods the averages of the *Regional Authority Index* scores are built. As for the annual coding, if the average *Regional Authority Index* score is equal to or higher than 17, the country is coded as a federal country for the respective time period and as a unitary country if the score is below 17. The solid dots in the right hand side scatter plots of Figures 1 to 3 represent federal countries. The non-filled circles represent unitary countries. In all right hand side plots in Figures 1 to 3 the dashed line is the fitted line for the federal countries, whereas the solid line is the fitted line for the unitary countries. The slopes of the fitted lines for the federal countries in all cases point to a positive relationship between fiscal decentralization and hours worked. In contrast, whereas the fitted lines for the unitary countries in Figures 1b and 2b for the measure of autonomous sub-central tax revenues TD and in Figure 1a for the measure of autonomous sub-central revenue RD point to a positive relationship between fiscal decentralization and hours worked, the fitted lines for the unitary countries in all other cases indicate a negative correlation between fiscal decentralization and hours worked.

The graphical analysis suggests that a positive relationship between fiscal decentralization and hours worked holds for federal countries and that the evidence is mixed for unitary countries. Further, the positive correlation between measures of fiscal decentralization and the measure of

hours worked depicted on the left hand side of Figures 1 to 3 in all but one plot therefore appears to be driven, especially for the periods 1990 to 1999 and 2000 to 2011, by the positive correlation of measures of fiscal decentralization and hours worked in federal countries.

To complement the results of the graphical analysis, I provide a cross-section regression analysis of the relationship between fiscal decentralization and hours worked. As a cross-section analysis exploits variation between countries, country-specific effects that do not change over time are not controlled for. I again use averages of the variables for three periods of roughly ten years (1980-1989, 1990-1999, and 2000-2011) and estimate the following specification for each of the three periods separately using Ordinary Least Squares:

$$(1)\ hours_s = \alpha + \beta \boldsymbol{X}_s + \theta D_s + \psi federal_s + \varphi(federal * D)_s + \varepsilon\ ,$$

where $hours_s$ denotes the hours worked per person aged between 15 and 64 in country s. $\boldsymbol{X}_s$ is a vector of control variables: $taxburden_s$ accounts for the country's total tax revenue as a share of GDP, CPI_s controls for the annual growth rate of a consumer price index, and $gdpgrowth_s$ captures a country's annual growth in total GDP. Since I estimate specifications for various decentralization measures separately, D_s denotes one of the four measures of fiscal decentralization used here: $revdec$, $expdec$, RD, and TD. The indicator variable $federal_s$ is based on the *Regional Authority Index* provided by Hooghe et al. (2009). As mentioned in section 3, the indicator variable $federal_s$ takes on the value 1 if a country in a certain year scores 17 or higher on the *Regional Authority Index* and 0 otherwise. $(federal * D)_s$ is an interaction term of the respective measure of fiscal decentralization and the indicator variable $federal_s$. ε is a stochastic error term.

Tables 3 to 5 show the results of the cross-section analyses. Overall, the results point to a positive average effect of fiscal decentralization on hours worked per person, as the coefficients on the measures of fiscal decentralization are all positive in Tables 3 to 5. Further, the

coefficients on the various measures of fiscal decentralization are statistically significant at the 10% level in 11 out of 16 of the specifications of Tables 3 to 5 that do not include the interaction term ($federal * D$). The results also provide evidence for a negative relationship between hours worked and the tax burden. Except for specification I of Table 3 the coefficients on the tax burden variable in Tables 3 to 5 are always negative and in 19 out of 24 specifications the coefficients are statistically significant at least at the 10% level. Except for specification VI of Table 3 the coefficients on CPI and GDP growth are statistically insignificant in all specifications of Tables 3 to 5.

The coefficients on the variable $federal$ that indicates whether or not a country displays a federal structure mostly carry a negative sign and are statistically insignificant except for specification III in Table 5. These results do not provide evidence in support of a statistically significant effect of whether a country has a rather federal or unitary political structure on the amount of hours worked. In Tables 3 to 5 the results of the *F*-test of joint significance of the variable $federal$ and the respective interaction term ($federal * D$) are mostly statistically insignificant except for specification V of Table 3 and specifications II and V of Table 4. The *F*-test results further suggest that there is no statistically significant effect of a country's political structure (federal or unitary) on hours worked if a potentially different effect of fiscal decentralization on hours worked depending on a country's political structure is allowed for through the introduction of the interaction term ($federal * D$). The results for the specifications that include the interaction term further support this finding.

Note that in the specifications that include the interaction terms the coefficients on the fiscal decentralization variables no longer indicate average effects. Rather, the coefficients capture the effect of a one-unit change in fiscal decentralization on hours worked conditional on

$federal$ being equal to zero.[10] To assess whether the effect of fiscal decentralization in federal countries has a statistically significant effect on hours worked the sum of the coefficient on the measure of fiscal decentralization and the respective interaction term has to be investigated. For instance, the estimate of the ψ coefficient on RD in specification III of Table 3 has to be added to the estimate of the coefficient φ on $federal * RD$: 8.865 - 4.83 = 4.035. This joint coefficient indicates the effect of a one-unit increase in RD when $federal$ is equal to 1. The standard error for the joint coefficient $(\varphi + \psi)$ in this case is 3.095 and the joint coefficient is therefore statistically insignificant at any of the commonly used levels of statistical significance.[11] As documented in Table 7, the estimates of all joint coefficients $(\varphi + \psi)$ of the respective measures of fiscal decentralization and the interaction term in Tables 3 to 5 are positive but statistically insignificant, suggesting that there is no statistically significant effect of fiscal decentralization on hours worked in federal countries. For the unitary countries the coefficients on the measures of fiscal decentralization in the specifications that do include the interaction term are also always positive, but statistically significant at least at the 10% level only in 3 out of 8 specifications.

In sum, the cross-section results do not confirm the difference between federal and unitary countries suggested by the graphical analysis. Whereas the graphical analysis suggests that a positive relationship between fiscal decentralization and hours worked can only be found for federal countries, the cross-section evidence suggests that there is a positive relationship between fiscal decentralization and hours worked, but does not strongly point to a difference between federal and unitary countries.

Panel evidence

[10] See, for instance, Brambor et al. (2006) for a discussion on the interpretation of interaction models.
[11] The standard error of the joint coefficient for the case that $federal$ is equal to 1 is calculated as follows: $\sqrt{var(\hat{\psi}) + var(\hat{\varphi}) + 2cov(\hat{\psi}\hat{\varphi})}$.

Next, to shed further light on the relationship between fiscal decentralization and annual hours worked per person, I analyze the relationship using data from an unbalanced panel of up to 27 OECD countries over the years 1980 to 2011. The panel analysis allows capturing time-invariant unobserved country specific factors by using country-fixed effects. The focus, therefore, is on within-country variation instead of between-country variation of countries that may differ with respect to many unobserved and not controlled for factors. Using Ordinary Least Squares I estimate the following regression:

(2) $hours_{st} = \alpha + \beta \boldsymbol{X}_{st} + \theta D_{st} + \psi federal_{st} + \varphi(federal * D)_{st} + \vartheta_s + \rho_t + \varepsilon_{st}$,

where X_{st} captures the same control variables as in equation (1) – $taxburden$, cpi, and $gdpgrowth$ – for country s in year t. D_{st} again stands for one of the four different measures of fiscal decentralization each used in one specification: $revdec$, $expdec$, RD, and TD. As before, the indicator variable $federal_{st}$ is derived from the *Regional Authority Index* provided by Hooghe et al. (2009). The term $(federal * D)_{st}$ interacts the respective measure of fiscal decentralization and the indicator variable $federal$. ϑ_s is a time invariant country fixed effect term. ρ_t is a country invariant year fixed effect term. I denote the stochastic error term ε_{st}.

The results of the panel estimations are reported in Table 6. The results suggest that there is a positive relationship between fiscal decentralization and hours worked primarily in the case of federally organized countries. The results also weakly confirm a negative relationship between the tax burden and hours worked, since the coefficients on the tax burden variable are negative in all but two specifications and are statistically significant at least at the 10% level in five out of 12 specifications.

In the specifications that do not contain the interaction term $(federal * D)$ the coefficient on the decentralization measure is either positive and statistically significant at the 1% level (specifications I, II, IV, and V) or carries a negative sign and is statistically insignificant

(specifications VII, VIII, X, and XI). The coefficients on the *classic* measures of fiscal decentralization $revdec$ (specifications I and II) and $expdec$ (specifications IV and V) suggest that the average effect of an increase in fiscal decentralization on hours worked per person is positive, whereas the coefficients on the *de facto* measures of fiscal decentralization RD (specifications VII and VIII) and TD (specifications X and XI) suggest that there is no statistically significant average effect of an increase in fiscal decentralization on hours worked per person.

In the four specifications that do not contain the interaction term the coefficients on $federal$ carry a positive sign and are statistically significant at least at the 10% level in 2 out of four specifications, weakly suggesting that the number of hours worked increases if a country moves from unitary to federal.

The results for the specifications that contain the interaction term $(federal * D)$ point to a systematically different effect of fiscal decentralization in federal countries compared to unitary countries for two reasons. First, in Table 6 the results of the *F*-test of joint significance of the variable $federal$ and the respective interaction term $(federal * D)$ are all four statistically significant at the 1% level. Second, the specifications containing the interaction term $(federal * D)$ allow to compare the effect of fiscal decentralization in federal and unitary countries. The coefficients on the measures of fiscal decentralization in specifications III, VI, IX, and XII capture the effect of a one-unit change of the respective variable on hours worked when $federal$ is equal to zero. The coefficient on $revdec$ in specification III is negative and statistically insignificant. The coefficient on $expdec$ remains positive and statistically significant at the 1% level. Interestingly, the coefficients on RD and TD in specifications IX and XII become statistically significant at the 1% level but carry a negative sign, suggesting that the effect of fiscal decentralization on hours worked in unitary countries is negative. To calculate the effect of

a one-unit increase in the measures of fiscal decentralization conditional on $federal$ being equal to 1, the coefficient on the respective measure of fiscal decentralization has to be added to the coefficient on the interaction term. As reported in Table 7, in all four specifications of Table 6 the estimate of the joint coefficient $(\varphi + \psi)$ is positive and statistically significant at least at the 5% level. The joint coefficients for the various measures of fiscal decentralization suggest that for federal countries an increase in fiscal decentralization is associated with an increase in annual hours worked.

In specification III, for instance, the sum of the estimates of the coefficients ψ on RD and φ on $federal * RD$ is equal to 2.305 with a robust standard error of 0.909. As shown in Table 7, an increase in fiscal decentralization by one percentage point is associated with an increase in hours worked between 1.958 hours (when TD is used as measure of fiscal decentralization) and 9.61 hours (when $expdec$ is used as measure of fiscal decentralization). To put these numbers into perspective and to demonstrate their economic significance, consider that for federal countries the standard deviation of TD is 19.6 and of $expdec$ is 11.35. The results suggest that a one standard deviation increase in TD is associated with an increase in the annual work load by about 39 hours, whereas the results suggest that a one standard deviation increase in $expdec$ is associated with an increase in hours worked by 109.

In specifications III, IX, and XII of Table 6 that include the interaction term a statistically significant positive effect of fiscal decentralization on hours worked is only found for federal countries. These results suggest that the positive average effect of fiscal decentralization on hours worked found in the specifications that do not include the interaction term is mainly driven by a positive effect of fiscal decentralization on hours worked in federal countries

In part, the panel evidence presented here confirms the results of the simple graphical analysis contained in Figures 1 to 3 that points to a positive relationship between fiscal

decentralization and hours worked in federal countries and an indeterminate relationship between fiscal decentralization and hours worked in unitary countries. Summarizing, the results of the panel analysis suggest that there is a positive relationship between fiscal decentralization and hours worked when countries are federal. The results for unitary countries are mixed. Whereas the results of the specifications using the *classic* measure of fiscal decentralization $expdec$ point to a positive relationship, the results for the specifications using the adjusted measures of fiscal decentralization RD and TD point to a negative relationship between fiscal decentralization and hours worked in the context of unitary countries.

5 Concluding remark

Three concluding remarks are warranted. First, the presented results suggest that after controlling for the effect of the overall tax burden there is a positive relationship between fiscal decentralization and hours worked. Increases in fiscal decentralization therefore appear to give governmental units an incentive to encourage their citizens to engage in productive activities, possibly by providing more effective governmental services and by reducing the regulatory burden faced by their citizens.

Second, the positive relationship between fiscal decentralization and hours worked can primarily be observed in countries with a federal political system. In the economics literature on fiscal decentralization the possible interaction of fiscal decentralization with the overall political system usually does not draw a lot of attention. Often the implicit assumption appears to be that the effects of fiscal decentralization – measured as tax revenue decentralization, overall government revenue decentralization, or government expenditure decentralization – can be assessed without reference to the remaining elements of the analyzed countries' political structures. The investigation provided here suggests that the interaction of fiscal decentralization with remaining characteristics of a country's political system deserves additional attention by

social scientists, because the results of the presented panel analysis suggest that fiscal decentralization only leads to stronger incentives to work in the 'official' economy in countries that feature an otherwise predominantly federal political system.

Third, the presented results imply that policy advice concerning a change in fiscal decentralization should not be unconditional. In the context of predominantly federally organized countries an increase in fiscal decentralization is associated with an increase in productive activity measured by the annual hours worked per person. However, in predominantly unitarily organized countries the effect of an increase in fiscal decentralization on the incentives to engage in productive activity measured by annual hours worked is ambiguous and the results for the *de facto* measures of fiscal decentralization suggest that in unitary countries fiscal decentralization is associated with a decrease in productive activity in terms of annual hours worked. Overall, the results thus suggest that policy makers would be well-advised to implement a truly federal political structure accompanied by a maximal degree of fiscal decentralization.

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Figure 1:
Averages of fiscal decentralization measures and hours worked in OECD countries, 1980-1989

Figure 1a: *Autonomous* sub-central government revenue in % of total government revenue (RD)

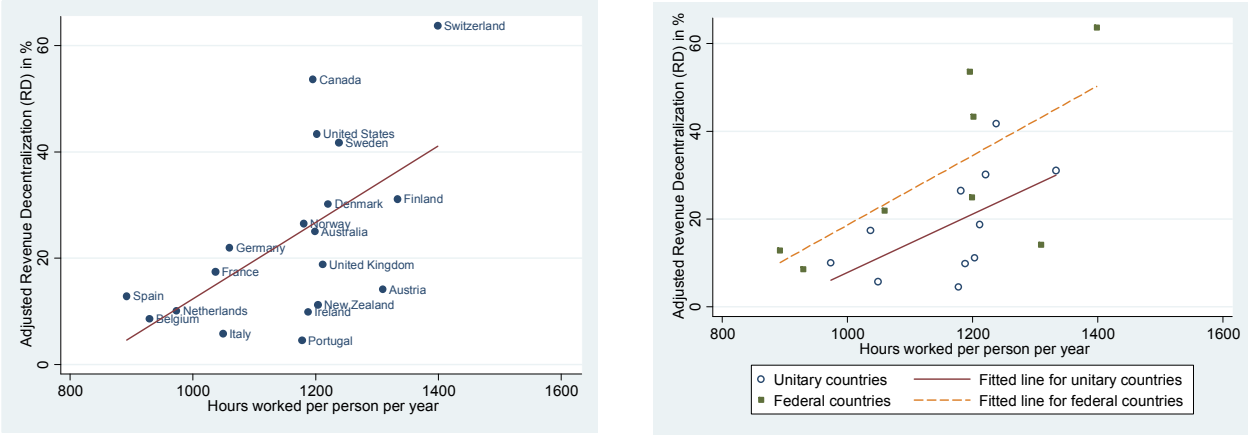

Figure 1b: *Autonomous* sub-central government tax revenue in % of total government tax revenue (TD)

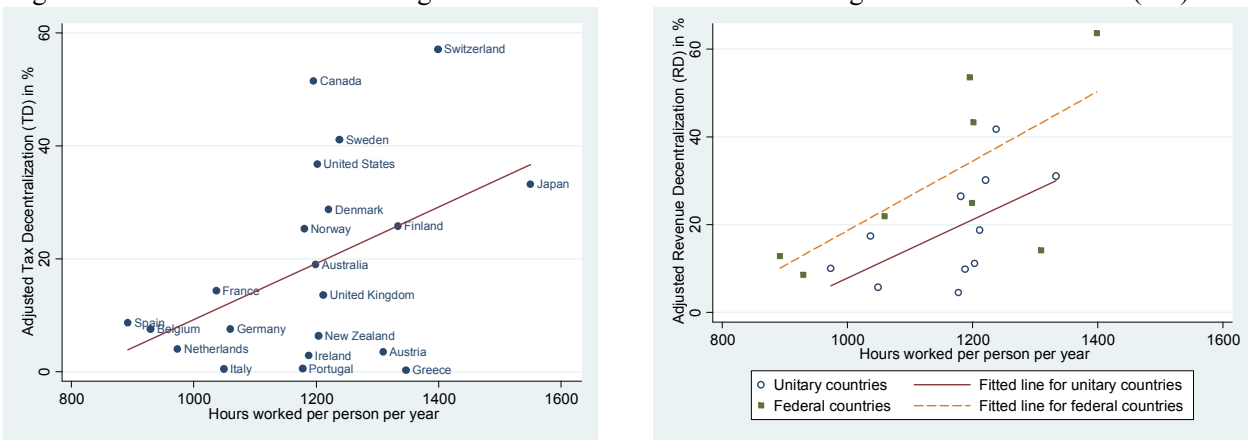

Figure 2:
Averages of fiscal decentralization measures and hours worked in OECD countries, 1990-1999

Figure 2a: *Autonomous* sub-central government revenue in % of total government revenue (RD)

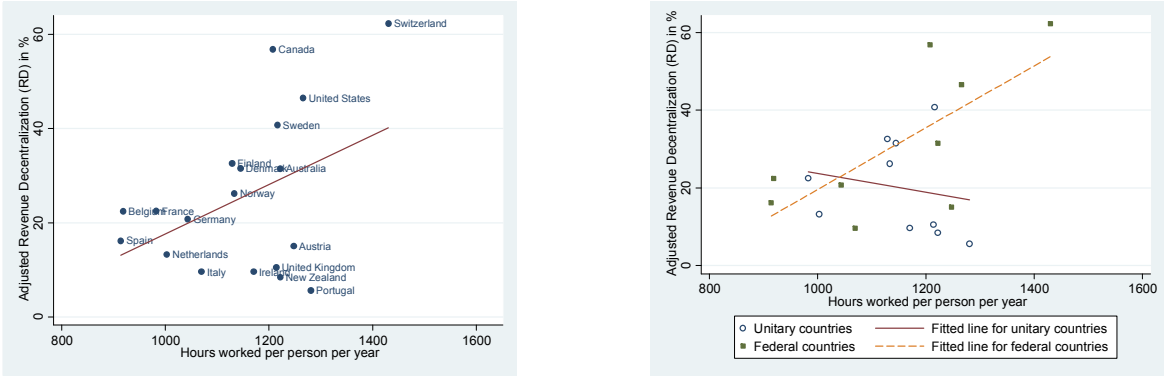

Figure 2b: *Autonomous* sub-central government tax revenue in % of total government tax revenue (TD)

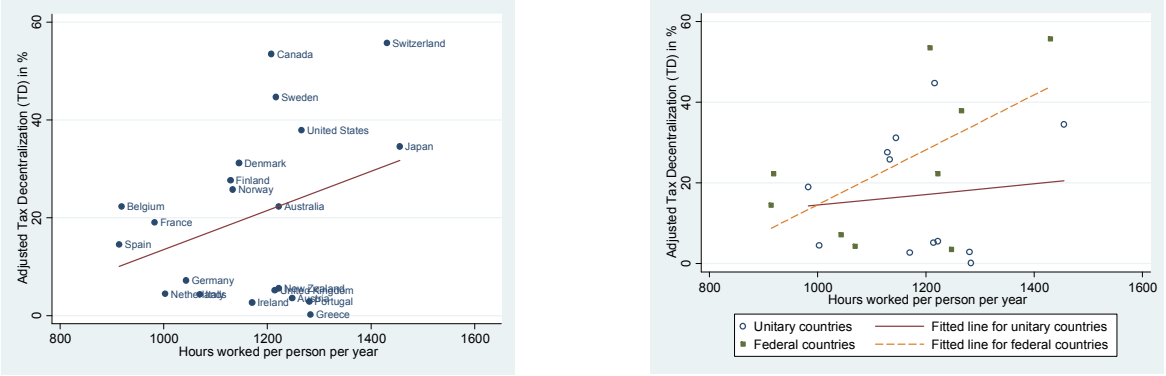

Figure 2c: Sub-central government revenue in % of total government revenue (revdec)

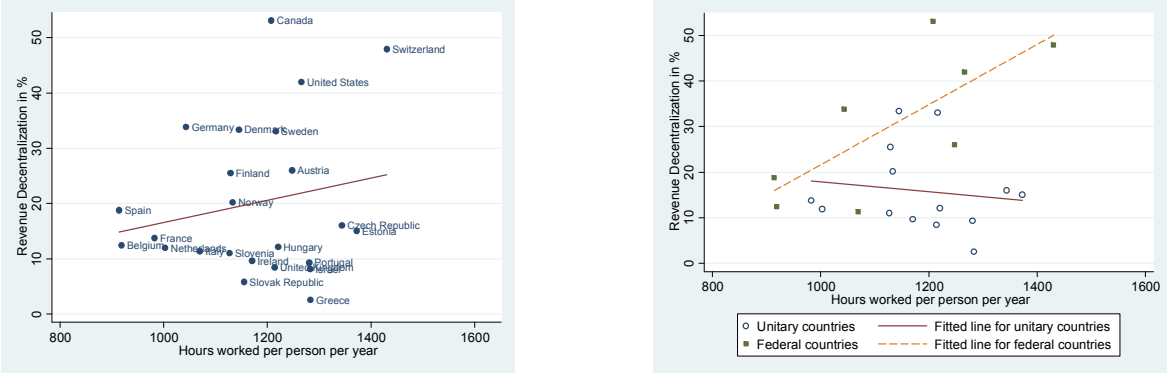

Figure 2d: Sub-central government expenditure in % of total government expenditure (expdec)

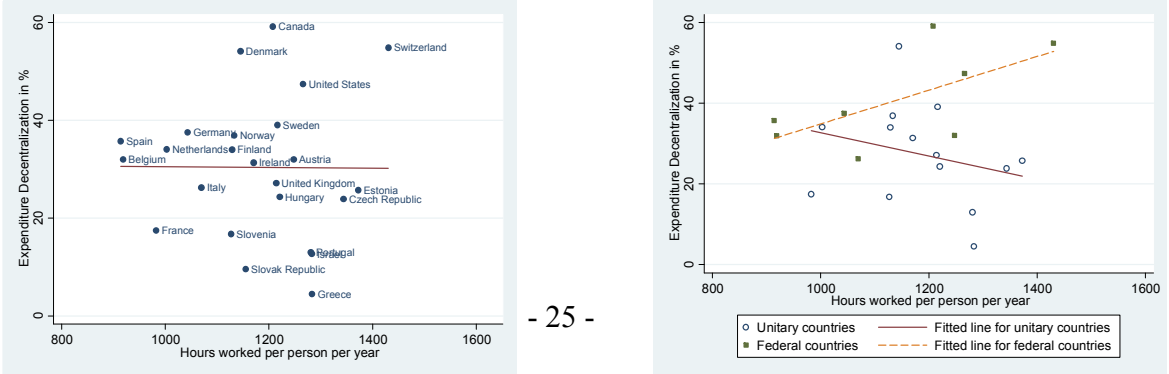

Figure 3:
Averages of fiscal decentralization measures and hours worked in OECD countries, 2000-2010

Figure 3a: Sub-central government revenue in % of total government revenue (revdec)

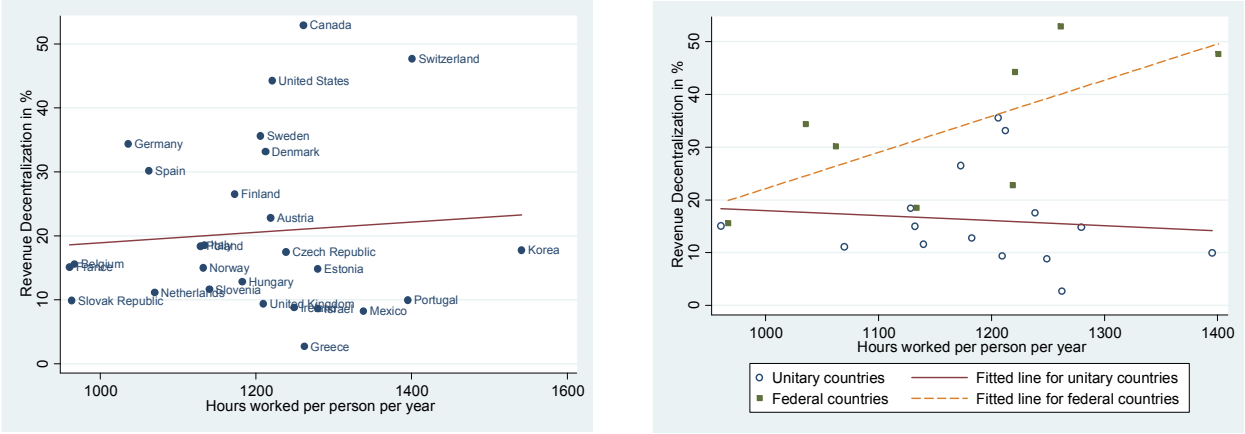

Figure 3b: Sub-central government expenditure in % of total government expenditure (expdec)

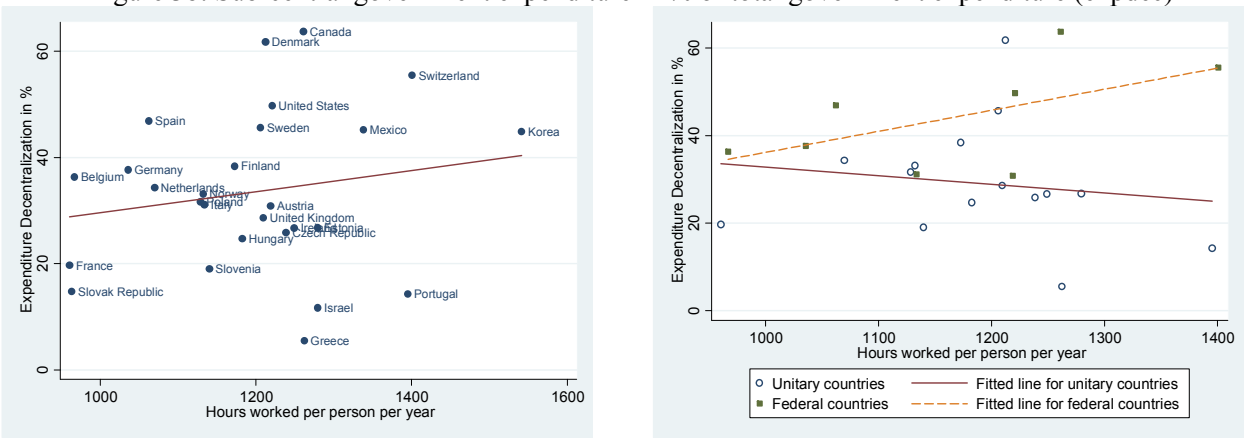

Table 1: Descriptive statistics

Variable	Description	Obs	Mean	SD	Min	Max	Source	Further comments
Hours worked per person per year	Hours worked per person per year in a country	890	1211.26	163.29	823.88	1780.51	Total hours worked of all people employed within a year in a certain country: The Conference Board Total Economy Database; Population of working age between 15-64: OECD	Construction: Total hours worked / working age population. Years included: 1980-2011
Tax burden	Government tax revenue as percentage of GDP	858	34.78	8.06	14.35	52.26	OECD	Years included: 1980-2011
CPI	Annual rate of change in a country's Consumer Price Index	906	11.00	54.81	-4.48	1281.44	OECD	Years included: 1980-2011
GDP growth	Annual rate of change in a country's total GDP	856	2.57	2.84	-14.07	12.27	OECD	Years included: 1980-2011
revdec	A country's fraction of overall consolidated government revenues not raised by the central government in a certain year.	491	21.09	13.66	2.43	55.23	OECD fiscal decentralization database	Years included: 1990-2011. Data on countries like Switzerland, the United Kingdom, Ireland, and Denmark are only available since 1990.
expdec	A country's fraction of overall consolidated government expenditures not spent by the central government in a certain year.	491	33.23	14.67	4.05	66.45	OECD fiscal decentralization database	Years included: 1990-2011. Data on countries like Switzerland, the United Kingdom, Ireland, and Denmark are only available since 1990.
RD	A country's fraction of the autonomous own revenue of sub-central governmental units of the total consolidated revenue of the overall government in a certain year.	337	25.76	15.94	4.13	64.44	Stegarescu (2004)	Years included: 1980-2000. Data for major countries before 1980 are not included in Stegarescu (2004) and the dataset ends with the year 2001 for which it is incomplete.
TD	A country's fraction of the autonomous own tax revenue of sub-central governmental units of the total consolidated tax revenue of the overall government in a certain year.	438	19.44	17.12	0.05	58.68	Stegarescu (2004)	Years included: 1980-2000. The Stegarescu (2004) dataset ends with the year 2001 for which it is incomplete.
Federal	Indicator variables that takes on the value 1 if the country is federal and 0 otherwise.	777	0.35	0.48	0	1	Hooghe et al. (2009)	If the *Regional Authority Index* provided by Hooghe et al. (2009) takes on a score of 17 or higher for a country in a certain year, *federal* is coded as 1. Otherwise *federal* is coded as 0. For the years 2007 to 2011 the same scores as in 2006 are assumed. Years included: 1980-2011

Table 2: Political structure and fiscal decentralization data availability

Country	Political structure	Fiscal decentralization data available for at least seven years from 1980 to 2011:			
		revdec	expdec	RD	TD
Australia	Federal	No	No	Yes	Yes
Austria	Federal	Yes	Yes	Yes	Yes
Belgium	Federal	Yes	Yes	Yes	Yes
Canada	Federal	Yes	Yes	Yes	Yes
Germany	Federal	Yes	Yes	Yes	Yes
Switzerland	Federal	Yes	Yes	Yes	Yes
United States	Federal	Yes	Yes	Yes	Yes
Italy	Unitary (1980-1992) Federal (1993-2011)	Yes	Yes	Yes	Yes
Spain	Unitary (1980-1981) Federal (1982-2011)	Yes	Yes	Yes	Yes
Czech Republic	Unitary	Yes	Yes	No	No
Denmark	Unitary	Yes	Yes	Yes	Yes
Estonia	Unitary	Yes	Yes	No	No
Finland	Unitary	Yes	Yes	Yes	Yes
France	Unitary	Yes	Yes	Yes	Yes
Greece	Unitary	Yes	Yes	No	Yes
Hungary	Unitary	Yes	Yes	No	No
Ireland	Unitary	Yes	Yes	Yes	Yes
Japan	Unitary	No	No	No	Yes
Netherlands	Unitary	Yes	Yes	Yes	Yes
New Zealand	Unitary	No	No	Yes	Yes
Norway	Unitary	Yes	Yes	Yes	Yes
Poland	Unitary	Yes	Yes	No	No
Portugal	Unitary	Yes	Yes	Yes	Yes
Slovenia	Unitary	Yes	Yes	No	No
Sweden	Unitary	Yes	Yes	Yes	Yes
United Kingdom	Unitary	Yes	Yes	Yes	Yes
Israel	Not classified	Yes	Yes	No	No
Korea	Not classified	Yes	Yes	No	No
Mexico	Not classified	Yes	Yes	No	No
Slovak Republic	Not classified	Yes	Yes	No	No

Table 3: Fiscal Decentralization and Hours Worked: Cross-section evidence, 1980 to1989

	OLS					
	(I)	(II)	(III)	(IV)	(V)	(VI)
Tax burden	1.146	-3.598	-9.379	-4.9	-12.36**	-18.68***
	(3.964)	(4.111)	(7.928)	(4.121)	(4.159)	(3.522)
CPI	9.059	-0.857	-4.872	3.787	-10	-10.23
	(9.260)	(12.760)	(9.988)	(8.821)	(10.040)	(7.148)
GDP growth	2.681	3.416	-14.12	9.855	-27.98	-64.55*
	(68.530)	(58.480)	(56.000)	(57.810)	(39.870)	(32.770)
RD	5.795**	5.666**	8.865*			
	(1.954)	(1.906)	(4.240)			
TD				4.574**	4.787**	10.41***
				(1.983)	(2.080)	(2.334)
Federal		-101.2	-37.89		-187.0*	-58.02
		(109.400)	(172.200)		(95.510)	(146.400)
Federal*RD			-4.83			
			(6.383)			
Federal*TD						-8.339*
						(4.237)
Constant	899.0**	1,190***	1,431***	1,214***	1,750***	1,986***
	(308.800)	(259.500)	(314.500)	(242.400)	(277.000)	(185.300)
F-test joint sign.			24.39***			1.66
Observations	18	18	18	20	20	20
R-squared	0.406	0.462	0.487	0.306	0.498	0.604

Note: The dependent variable is hours worked per person per year in a country on average during the period 1980-1989. The *F*-test is of joint significance of Federal and the respective interaction term. Standard errors (denoted in parentheses) are corrected for heteroskedasticity. ***, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.

Table 4: Fiscal Decentralization and Hours Worked: Cross-section evidence, 1990 to1999

	OLS											
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
Tax burden	-10.05**	-13.69***	-14.90*	-10.52**	-14.98***	-13.81*	-6.977	-10.63**	-9.546	-10.89***	-13.19***	-14.63***
	(4.105)	(3.304)	(8.356)	(4.538)	(4.460)	(7.487)	(3.955)	(4.621)	(8.095)	(3.496)	(3.079)	(2.841)
CPI	0.322	-0.481	-0.42	0.0358	-0.47	-0.53	13.33	10.4	12.18	5.654	1.007	3.079
	(0.848)	(0.534)	(0.645)	(0.750)	(0.498)	(0.670)	(35.920)	(26.680)	(22.840)	(11.010)	(7.649)	(8.971)
GDP growth	5.276	-21.45	-21.5	0.822	-28.64	-26.87	-1.073	-15.38	-15	-29.6	-29.96	-24.08
	(24.360)	(30.710)	(31.040)	(23.690)	(33.480)	(34.280)	(27.020)	(32.960)	(34.790)	(26.700)	(20.030)	(25.910)
revdec	1.941	5.147***	6.321									
	(1.556)	(1.517)	(5.577)									
expdec				0.432	3.805*	3.051						
				(1.407)	(1.960)	(3.780)						
RD							3.487*	4.043**	3.33			
							(1.818)	(1.641)	(4.448)			
TD										2.736*	3.055*	4.721**
										(1.459)	(1.551)	(2.009)
Federal		-181.0**	-148.4		-163.9*	-217.3		-107.6	-128		-108.8	-60.3
		(75.740)	(183.400)		(88.840)	(242.100)		(87.870)	(147.500)		(67.540)	(118.800)
Federal*revdec			-1.739									
			(8.366)									
Federal*expdec						1.660						
						(6.304)						
Federal*RD									1.089			
									(5.921)			
Federal*TD												-2.567
												(3.160)
Constant	1,499***	1,699***	1,727***	1,557***	1,748***	1,719***	1,285***	1,506***	1,471***	1,566***	1,708***	1,713***
	(192.800)	(143.800)	(244.200)	(181.200)	(163.200)	(217.400)	(281.600)	(279.600)	(336.900)	(195.600)	(129.600)	(118.200)
F-test joint sign.			2.68			1.62			0.7			5.08**
Observations	23	21	21	23	21	21	18	18	18	20	20	20
R-squared	0.254	0.534	0.536	0.23	0.446	0.448	0.362	0.481	0.482	0.448	0.57	0.584

Note: The dependent variable is hours worked per person per year in a country on average during the period 1990-1999. The *F*-test is of joint significance of Federal and the respective interaction term. Standard errors (denoted in parentheses) are corrected for heteroskedasticity. ***, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.

Table 5: Fiscal Decentralization and Hours Worked: Cross-section evidence, 2000 to 2011

	OLS					
	(I)	(II)	(III)	(IV)	(V)	(VI)
Tax burden	-11.22***	-10.74**	-16.09*	-10.83***	-12.00**	-13.09*
	(3.773)	(4.291)	(8.755)	(3.746)	(4.986)	(7.138)
CPI	-28.67	0.755	2.236	-25.11	-5.862	-5.774
	(26.350)	(15.470)	(16.440)	(22.470)	(18.550)	(19.070)
GDP growth	10.49	-20.26	-31.12	11.62	-15.83	-16.85
	(27.490)	(27.440)	(30.350)	(28.310)	(27.960)	(28.640)
revdec	0.323	3.691*	7.473			
	(1.722)	(1.744)	(5.015)			
expdec				1.162	2.289	2.808
				(1.813)	(1.926)	(3.035)
Federal		-122.5	14.94		-100.9	-50.32
		(70.400)	(168.300)		(74.310)	(244.400)
Federal*revdec			-6.58			
			(7.492)			
Federal*expdec						-1.401
						(6.025)
Constant	1,645***	1,581***	1,744***	1,586***	1,633***	1,662***
	(213.900)	(213.100)	(300.900)	(234.500)	(232.400)	(264.000)
F-test joint sign.			1.76			1.03
Observations	26	22	22	26	22	22
R-squared	0.323	0.395	0.421	0.336	0.351	0.353

Note: The dependent variable is hours worked per person per year in a country on average during the period 2000-2011. The *F*-test is of joint significance of Federal and the respective interaction term. Standard errors (denoted in parentheses) are corrected for heteroskedasticity. ***, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.

Table 6: Fiscal Decentralization and Hours Worked: Panel evidence

	OLS											
	1990 to 2011						1980 to 2000					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
Tax burden	0.27	-2.704	-3.096*	0.904	-2.34	-2.827*	-4.929***	-5.713***	-4.801**	-1.951	-2.574	-2.393
	(2.008)	(1.644)	(1.633)	(1.893)	(1.491)	(1.461)	(1.829)	(2.077)	(2.029)	(1.624)	(1.778)	(1.726)
CPI	4.900***	5.322***	5.130***	3.765***	3.844**	3.774**	4.591***	4.637***	4.748***	1.313	1.311	0.831
	(1.430)	(1.593)	(1.633)	(1.393)	(1.520)	(1.507)	(1.718)	(1.742)	(1.697)	(1.477)	(1.481)	(1.501)
GDP growth	0.484	0.104	0.198	-0.216	-0.326	-0.347	0.184	0.115	-0.371	1.322	1.339	0.333
	(1.332)	(1.396)	(1.374)	(1.313)	(1.338)	(1.345)	(1.821)	(1.822)	(1.773)	(1.818)	(1.821)	(1.750)
Federal		22.160	-39.51		34.89*	-59.68		32.070	-34.47		28.86*	-5.463
		(19.570)	(28.440)		(19.160)	(41.680)		(21.860)	(26.310)		(17.250)	(19.500)
revdec	3.152***	3.232***	-0.452									
	(1.020)	(1.092)	(1.268)									
expdec				6.304***	7.763***	6.142***						
				(0.948)	(0.980)	(1.222)						
RD							-0.293	-0.43	-4.874***			
							(0.749)	(0.741)	(1.262)			
TD										-0.502	-0.765	-5.827***
										(0.815)	(0.845)	(1.450)
Federal*revdec			5.608***									
			(1.881)									
Federal*expdec						3.468**						
						(1.363)						
Federal*RD									7.179***			
									(1.529)			
Federal*TD												7.785***
												(1.677)
F-test joint sign.			4.84***			5.24***			11.03***			10.78***
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	460	407	407	460	407	407	319	319	319	417	417	417
R-squared	0.935	0.929	0.931	0.943	0.942	0.943	0.91	0.911	0.915	0.906	0.906	0.911

Note: The dependent variable is hours worked per person per year in a country. The *F*-test is of joint significance of Federal and the respective interaction term. Standard errors (denoted in parentheses) are corrected for heteroskedasticity. ***, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.

Table 7: Addendum to the interaction term specifications of Tables 3 to 6.

Table 3 (III)	ψ of RD	φ of Federal*RD	ψ + φ	SE (ψ + φ)
	8.865	-4.830	**4.035**	**3.095**
Table 3 (VI)	ψ of TD	φ of Federal*TD	ψ + φ	SE (ψ + φ)
	10.410	-8.339	**2.071**	**2.912**
Table 4 (III)	ψ of revdec	φ of Federal*revdec	ψ + φ	SE (ψ + φ)
	6.321	-1.739	**4.582**	**3.366**
Table 4 (VI)	ψ of expdec	φ of Federal*expdec	ψ + φ	SE (ψ + φ)
	3.051	1.660	**4.711**	**3.713**
Table 4 (IX)	ψ of RD	φ of Federal*RD	ψ + φ	SE (ψ + φ)
	3.330	1.089	**4.419**	**2.501**
Table 4 (XII)	ψ of TD	φ of Federal*TD	ψ + φ	SE (ψ + φ)
	4.721	-2.567	**2.154**	**2.241**
Table 5 (III)	ψ of revdec	φ of Federal*revdec	ψ + φ	SE (ψ + φ)
	7.473	-6.580	**0.893**	**3.371**
Table 5 (VI)	ψ of expdec	φ of Federal*expdec	ψ + φ	SE (ψ + φ)
	2.808	-1.400	**1.408**	**4.173**
Table 6 (III)	ψ of revdec	φ of Federal*revdec	ψ + φ	SE (ψ + φ)
	-0.452	5.608	**5.156*** **	**1.336**
Table 6 (VI)	ψ of expdec	φ of Federal*expdec	ψ + φ	SE (ψ + φ)
	6.142	3.468	**9.610*** **	**1.023**
Table 6 (IX)	ψ of RD	φ of Federal*RD	ψ + φ	SE (ψ + φ)
	-4.874	7.179	**2.305*** **	**0.909**
Table 6 (XII)	ψ of TD	φ of Federal*TD	ψ + φ	SE (ψ + φ)
	-5.827	7.785	**1.958*** **	**0.842**

Note: Standard errors (SE) are corrected for heteroskedasticity. ***, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.